THE
VETERINARY JOURNAL

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DECEMBER, 1931.

DISTEMPER IMMUNISATION BY DRIED VIRUS.

It will be good news for the members of the veterinary profession to know that a reliable method of distemper immunisation, which can be put into actual practice, has at last been perfected; so that a preventive treatment of the dogs in the foxhound, sporting and show kennels, as well as household pets, is now practicable.

That this result has been attained by the combined efforts of members of both branches of the profession of medicine is a further instance of the value of the study of Comparative Medicine, and the profession owes a great debt of gratitude to Major Dalling, whose article we publish in this issue, for the patient work by which he has been able to put into practical shape the laboratory work which was carried out by Messrs. Laidlaw and Dunkin on the lines originally laid down by Professor Carré and Dr. Puntoni.

A good deal of very adverse criticism has appeared lately in the lay press, and for some time there was a prospect that the good work which was originally started by THE VETERINARY JOURNAL and *The Field* would fall to the ground.

Major Dalling has solved the difficulty of maintaining the immunising potency of the distemper virus by preparing and issuing it "dry." He has also proved from long and continued observations that in this form "it retains its potency over long periods." Major Dalling makes the assertion, from field experiments carried out amongst 1,025 foxhounds, that "vaccine followed by 'dry' virus is at least 99 per cent. efficient as an immunisation method for canine distemper." The whole article should be read with care, and there is no doubt about the welcome which such good news will receive amongst veterinary surgeons and their canine *clientèle*.

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AN ITEM OF GOOD NEWS FOR THE ROYAL VETERINARY COLLEGE.

It will be recollected that in 1926, the Will of Mrs. Sarah Martha Grove-Grady, the daughter of Mr. J. Beaumont, of Huddersfield, was proved and made public. In this Will the sum of £200,000 was to be devoted to the founding of a new anti-vivisectionist organisation to be known as the Beaumont Animals' Benevolent Society. This huge sum of money was the residue of her estate after the following legacies, with one exception, had been paid.

Legacies Under the Will.

£5,000, Our Dumb Friends' League.

£9,000, The Anti-Vivisection Hospital.

£6,000, The National Anti-Vivisection Society (Mr. Coleridge's Society).

£1,000, The Mayhew Homes for Stray Cats.

£6,000, The North London Dogs' Home.

£5,000, The National Canine Defence League.

£4,000, The National Equine Defence League.

£5,000, The British Union for the Abolition of Vivisection (Dr. Hadwen's Society).

£50,000, The Animals' Dispensaries.

£10,000, The Royal Society for the Prevention of Cruelty to Animals (refused).

The R.S.P.C.A. was unable to accept the legacy of £10,000 owing to the fact that Mrs. Grove-Grady had stipulated that all members of the Council and officials at the headquarters must be, and always have been, anti-vivisectionists. The Will also stipulated that " The Beaumont Animals' Benevolent Society " should have for its objects the purchase of a certain amount of land which the committee of the said Society would deem suitable and proper for the purpose of providing a refuge or refuges for the preservation of all animals, birds, and any other creatures, not human, which being *feræ naturæ* may be living on such land at the time of purchase, or should be otherwise placed on such land, should be safe from molestation or destruction by man. A further clause provided for the " founding, establishing, endowing, supporting, maintaining or providing of hospitals or homes for animals in Great Britain, having no declared vivisectionist upon the governing body or bodies thereof, or in any way connected with the management thereof."

In October, 1926, the general committee of the Research Defence Society learned that an appeal was to be made against disposal of

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the residuary estate in the manner specified under the Will, and it was decided to do everything possible to support the appeal. Affidavits by Lord Knutsford, Sir Walter Fletcher, Professor Basil Buxton, and Dr. Andrew Balfour were filed dealing with medical and veterinary research, so-called vivisection.

In December, 1927, the Society heard that Mr. Stephen Coleridge and Dr. Hadwen had sworn affidavits in support of the Will. Copies of these were obtained, and the honorary secretary of the Research Defence Society, Dr. G. P. Crowden, swore an affidavit refuting certain points in each, and drawing attention to the fact that " In England, the voluntary hospitals are generally looked upon as amongst the leading charities of the country, and it seems paradoxical to suggest that the provision of funds for persons who are attacking such hospitals can rightly be regarded as charitable."

That anti-vivisectionists did actually try to persuade the public to refrain from subscribing to the appeals of hospitals, had been made clear by Mr. Coleridge himself in correspondence which appeared in *The Times* in June, 1928.

The Will was disputed in July, 1928; the case came before the Chancery Division of the High Court of Justice, and Lord Justice (then Mr. Justice) Romer gave judgment upholding the Will in that in his opinion " the Trusts declared of the residuary estate are valid," and that " the Trusts declared of the residuary estate are charitable." However, in the course of his judgment leading up to his decision, he stated: " The reason why a gift for the protection of animals from cruelty is charitable is not because of the benefit that lower animals derive from such a gift, but because of the benefits it confers on the community."

Moreover, he based his judgment partly on a decision given by a judge in the year 1895, in a case in which the question arose whether a gift to certain " Anti-Vivisection Societies " could be regarded as a good, charitable gift. It was held in that case (in *re* Foveaux) that it could, though the judge said that it was near the borderline. But the judge rested his decision on the following reason: " The intention is to benefit the community; whether, if they achieved their object, the community would, in fact, be benefited is a question which, I think, the Court is not required to express an opinion."

It should be noted that in the 1895 case, the gift was upheld as charitable because the intention of the donor was to benefit the community, not because it was a gift to anti-vivisection societies. In a case heard in 1923, a decision was given that the question whether a gift is a good, charitable gift, as being for the benefit of the public,

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is a question to be judged not by the intention of the donor, but by the evidence before the Court. It, therefore, appeared that there were good grounds for an Appeal against the judgment of Mr. Justice Romer, as it was felt that benefit to the community or to animals by the Trusts under the Will of Mrs. Grove-Grady had not been established.

The appeal was proceeded with, and on February 13th, 1929, the Court, consisting of Lord Hanworth (Master of the Rolls), Lord Justice Lawrence, and Lord Justice Russell, delivered judgment reversing the previous decision. After the judgment of the Court of Appeal had been delivered, Notice of Appeal was given, and it seemed probable that the case would be taken to the House of Lords. However, the Appeal was withdrawn, as all the parties concerned, *viz.*, the Attorney-General, the next of kin, and the Trustees of the Will, had arrived at a compromise whereby the next of kin offered to provide the sum of £25,000 under a scheme to be settled in the Chancery Division of the High Court of Justice, such scheme to provide for the application of the above sum in establishing or assisting homes or hospitals for animals in Great Britain.

The sequel was brought before Mr. Justice Maugham in the High Court of Justice, Chancery Division, on November 24th, 1931: Between: *Plaintiffs*—Edmund Charles Sheldon Plowden, Basil Muirhead, and the Public Trustee; and *Defendants*—Kate Laurence, wife of George Laurence; Agnes Christina Leux (spinster), Amabella Burgess (widow), Archibald Hoare, George Bird, Alice Turner (wife of Matthew Mark Turner), The Royal Society for the Prevention of Cruelty to Animals, Larrett Crossley Parkin, and Joseph Lofthouse, on behalf of the Yorkshire Society for the Encouragement of Humane Treatment and Kindness to Pit Ponies, Arthur Wilson, Phoebe Agnes Lamb (widow), since deceased, His Majesty's Attorney General, and Charles Richardson (added by Order dated 23rd January, 1928).

The scheme by the Plaintiffs was for the application of the sum of £25,000 to be handed over under certain conditions to the Governors of the Royal Veterinary College for the purpose of erecting as part of the re-building scheme a hospital for the treatment of animals to be known as "The Beaumont Animals Hospital." A certain proportion of the sum is put down for the building and the remainder for equipment and endowment, and it is especially stipulated that "no part of the Trust Fund, or the income thereof, is to be available for anti-vivisection propaganda." Mr. Justice Maugham, in giving judgment, said "that he had no hesitation in saying that the scheme ought to be approved. It was an admirable way of dealing with the fund.

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General Articles

CANINE DISTEMPER IMMUNISATION.

Use of Various Prophylactics in Hunting Packs.

By T. DALLING, M.R.C.V.S.,

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We have previously described the events in connection with canine distemper prophylaxis up to midsummer, 1931. About this time a few reports received indicated that some batches of vaccine, of which two doses had been injected (no living virus having been given), failed to produce a high degree of immunity in foxhounds. We at once took steps to test this experimentally. Seven hounds which had received two doses of vaccine were sent to the laboratory from two different kennels, and their immunity was tested by the injection of virulent virus. We were not satisfied that a high degree of immunity was present in all the hounds tested, and we accordingly communicated with veterinary surgeons, who had treated hounds with two doses of vaccine, offering them serum and virus for all hounds so treated. This resulted in serum and virus being issued experimentally for 295 of the 774 couple of hounds which had already been injected with two doses of vaccine. Thus, there were still 479 couple which had been treated with two doses of vaccine only. In some cases only some of the already treated hounds in the pack received serum and virus. Most of these hounds were treated after assembly in the kennels.

Serum and Virus.

It was now decided to carry out a large field experiment to test the serum-virus simultaneous method, and 257 couple of hounds in 21 different packs were included in the experiment. In some cases the treatment was carried out at walk, but in others the hounds were injected in the kennels.

The original Laidlaw-Dunkin method was the use of vaccine, followed by fresh, moist virus. Our laboratory experiments showed that equally satisfactory results were obtained when dried virus was used. To test this in the field, many doses of vaccine and dried virus were distributed to veterinary surgeons experimentally during the early part of 1931, and among dogs treated were 540½ couple of

hounds in 31 different packs. In practically every case the treatment was carried out at walk.

We have kept in close touch with the veterinary surgeons concerned, and reports have been received from time to time concerning the results of the various methods used during the experimental period. We have paid visits to several kennels, especially those in which severe reactions or so-called " breakdowns " in immunity were recorded. An analysis of the results shows that during the experimental period, from September, 1930, to April, 1931, 3,169 hounds were treated by one or other of the above methods, and the following are our conclusions.

Double Vaccine.

(1) Two doses of vaccine as a method of immunising hounds against distemper may give unsatisfactory results, in that the treated hounds may fail to withstand exposure to natural infection. It is true that some good reports have been received, and there are those who desire to continue the use of this method in the future. We feel that the potency of the vaccine used controls the degree of immunity produced, and that though every batch used conformed to a minimum standard for antigenic value, we have no indication of its value above that standard. In the laboratory, where the experimental dogs are under our strict control during the whole immunisation period, we still get good results with this method. Because of the unreliability of the method we do not at present advise the use of two doses of vaccine for immunising hounds against distemper. We have reports of 479 couple of hounds in 19 packs treated by the double dose of vaccine method. Of these, we have classified as " good," eight packs (*e.g.*, Pack 13) ; as " moderately good," five packs (*e.g.*, Pack 5) ; and as " bad," six packs (*e.g.*, Pack 28).

Pack 13.—Twelve couple were treated in January and February, 1931. A recent report states that the hounds have all done well, and have withstood infection—untreated hounds going down. The writer adds : " I have had invariable success with two doses of vaccine at fourteen days interval."

Pack 5.—Six couple treated in December, 1930. A recent report states that although " distemper " occurred in the kennels, and practically every inoculated hound showed symptoms, the outbreak was extremely mild, and no death occurred. It adds : " I am pleased to say that the master was very satisfied with the result of the double vaccine treatment."

Pack 28.—Between August and November, 1930, sixty couple were treated. All hounds did well till they returned to the kennels in March, 1931. Within a fortnight " distemper " broke out. About

50 per cent. were affected. All recovered except 8½ couple, which died after showing evidence of pneumonia. The report adds: "Considering the severity of the attack, I consider the mortality very small. I thought the death-rate would have been nearer 50 per cent. The master, kennel-huntsman, and kennelman are of the same opinion. They still hold that the vaccine saved many of the dogs' lives. The complete absence of bad after-effects was very unusual, and the quick recoveries were wonderful."

SERUM AND VIRUS.

(2) The use of hyper-immune serum and dried active virus as a simultaneous injection gives, on the whole, good results. Two points require consideration: (*a*) there may be a reaction, sometimes severe, following their injection. This has occurred in a few of the treated hounds, and has also been observed among privately-owned dogs. On occasion it has been necessary to inject a further dose of hyper-immune serum when the reaction was observed. It would appear that in privately-owned dogs in which a careful control can be kept (taking of temperatures, etc.), the method suits well, but in hounds there is some risk—especially as it is impossible to keep a close eye on injected hounds scattered all over the country at walk—for some few days after treatment. (*b*) The immunity may on occasion be of low order or of short duration. Though many treated hounds have escaped infection when exposed purposely, a few have failed to resist such exposure to natural infection. Bearing these two points in mind we feel that more experience of the method must be gained before complete confidence is placed in it.

We have recently received reports of 34 packs (552 couple). Of these we classify as "good," 22 packs (*e.g.*, Packs 4 and 10); as "moderately good," eight packs (*e.g.*, Pack 20); and as "bad," four packs (*e.g.*, Pack 57).

Pack 4.—Eleven couple were treated on their return to the kennels from walk in February, 1931. There were no severe reactions, and a recent report states that there has been no illness among them, and that "I am of opinion that the inoculations prevented the annual occurrence of 'distemper' at these kennels."

Pack 10.—In February, 1931, 15 couple were treated. No severe reactions were noted. The puppies were returned to kennels in excellent condition, and were purposely exposed to infection. Several untreated puppies died, but no treated hound showed any evidence of disease, and they are now hunting regularly.

Pack 20.—Nine couple were treated in February, 1931. A recent report states that three puppies were killed after treatment because

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of their inferior quality. Some puppies on return to the kennels showed very mild " distemper," but received no treatment, and did well. The master, in his remarks at the Annual Puppy Show, expressed his opinion that the good show of puppies was in a great measure due to vaccination.

Pack 57.—Twenty-two couple were treated in January, 1931. Several couple were treated in the kennels in which " distemper " was present. They all developed clinical " distemper " within two weeks after being treated, and 5½ couple died. The remainder treated in the kennels recovered and did well. Those treated at walk were brought back to the kennels in two groups. One group returned two months after treatment, and have withstood infection. The other group (6 couple) were kept at walk for four months after treatment, and two months after returning to the kennels they all developed symptoms of clinical distemper, and one died.

VACCINE AND VIRUS.

(3) The use of vaccine followed in 14 days by dried active virus is a highly satisfactory method of immunising hounds against distemper, especially when the treatment is carried out at walk. Of the 1,081 hound puppies treated between November, 1930, and March, 1931, we have definite up-to-date information regarding 1,025, in 23 packs. No reply to our repeated request for information has been received from two packs. If we make the improbable assumption that *all* reported cases of disease among the hounds were due to true virus distemper, the number of affected hounds reported is 20, of which 14 recovered, and six died, *i.e.*, 1.8 per cent. showed evidence of disease, and 0.4 per cent. died. Among the above-mentioned 20 hounds, illness occurred in eight soon after virus injection (three died), and in 12 after return to the kennels, or on exposure to infection, (two died). The final figures are, therefore, of 1,025 hounds treated with vaccine and dried virus, 8, or 0.7 per cent., " reacted " soon after treatment, and 12, or 1 per cent., failed to withstand " infection " later.

The following are three typical examples of reports of the treatment of hounds by the vaccine followed by dry virus method :

Pack 2.—In January, 1931, twenty-eight couple were treated at walk. The report states that the treatment has been successful. " Distemper " occurred in the kennels in which seven couple of uninoculated puppies were present. Twelve of these died, while only one of those inoculated was affected ; it recovered.

Pack 18.—Fifteen couple were treated in January, 1931. All puppies came in from walk in March, 1931, in excellent condition,

and there has been no trouble of any kind. The report adds: "It seems a curious thing that the 'walker' of the puppy invariably thinks that the puppies do very much better after the vaccination, as also do the huntsmen when the puppies get back from walk."

Pack 66.—Six couple were treated in February, 1931. Although "distemper" was present in the kennels when the puppies returned from walk, no inoculated puppy showed any evidence of infection, and they have remained well all the time.

In certain daily newspapers recently there appeared lists of hunts in which losses have occurred during the past season, as well as those in which no distemper has been observed. Some packs with hounds treated by methods referred to in this paper are included in these newspaper lists. We find from our records that in the list of those in which losses have occurred, two packs were treated by the double vaccine method, two by the serum-virus method, and none by the vaccine-virus method. Seventeen were not treated by any of the above methods as far as we know. Our records of several of these packs show that only some of the hound puppies were treated, and that the losses have been confined almost entirely to the uninoculated. On the other hand, among those in which no distemper occurred, six packs were treated by the vaccine and dry virus method, and three by the serum-virus method, while in two packs mentioned we have no record of any treatment having been adopted.

The foregoing deals with foxhounds, etc., treated during the field observation period, and the treatment of these animals was carried out on an experimental basis. In addition, several thousand doses were given for the treatment of dogs other than foxhounds, etc. The results are of a similar nature. During the past few months the various materials used in the treatment and prevention of distemper have again been issued commercially. The number of doses issued is large, and reports received indicate that the vaccine-virus method is giving highly satisfactory results, that serum is being widely used for treatment early in the attack, and that the serum-virus simultaneous method has, with a few exceptions, given good results.

Summary.

(1) Tissue containing canine distemper virus can be dried, and such dry virus retains its potency over long periods.

(2) The immunity produced by two doses of distemper vaccine without the use of living virus may in some instances be of low degree or of short duration. The degree of immunity produced is presumably governed by the antigenic value of the vaccine used.

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(3) The serum-virus simultaneous method of immunising hounds against distemper is of considerable value. Further experience is necessary before a final estimate of its value can be made, especially with regard to the occurrence of reactions soon after its use, and the degree and duration of immunity produced in the field.

(4) Vaccine followed by dry virus is at least 99 per cent. efficient as an immunisation method for canine distemper. In the field experiments carried out among foxhounds, of 1,025 hounds treated, 8, or 0.7 per cent., " reacted " soon after treatment, and 12, or 1 per cent., failed to withstand " infection " later.

It is a pleasure to acknowledge the assistance we have received from discussions with Dr. P. P. Laidlaw and Mr. G. W. Dunkin, during the whole of this work.

REFERENCES.

Dalling T.: *Veterinary Record*, 1929, September 14th; *ibid.*, 1931, June 6th.
Laidlaw, P. P., and Dunkin, G. W.; *Journ. Comp. Path. and Ther.*, 1928, Vol. XXI., p. 209.

THE PROBLEM OF INSTINCT.

By Dr. Med. Vet. WILL. W. PETERSEN.
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STRICTLY scientifically speaking, the study of the psychological problems lies on or beyond the extreme borders of the possibility of definite research, and when dealing with animal psychology we must always bear in mind that man's mental life is the only one we really know; we can only examine the mental life of all other higher creatures by means of comparison. Another difficulty lies in the fact that there are not, and cannot be, any fixed limits between the different forms of mental appearances, because the various manifestations of psyche blend together; there will always be boundaries between *anima sensitiva* and *anima intellectualis*.

Broadly speaking, we may state that if an animal acts quite independent of any instruction, observation, or experience, he acts purely instinctively; if, on the other hand, an animal is able to acquire knowledge by instruction, observation or experience, he is more than a being of pure and simple impulses or instinctive actions. But it may be exceedingly difficult, and often impossible, to decide where the behaviour—resting partly on acquired memory, experience, reflection, purpose and resolution—begins, and where the appearances which are due only to a transmitted higher instinct end.

Taking the word in the most comprehensive sense, instinct is a combination of something simple and something complicated, something inherited, and something individually acquired.

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Unfortunately, different authors do not always give the same definition of the term " instinct " ; and being a word with confused interpretation, we cannot be astonished that some authors (*e.g.*, Waxweiler and Bohn) wish to remove the expression " instinct " entirely from scientific language. Other investigators wish to give the expression a well defined meaning, or they wish to preserve the wide meaning of the word, but in such a way that an experimental analysis is in each instance the basis of every quoted case. The investigators who support the last-mentioned point of view will probably be willing to accept the following definition : Instinct is a beneficial, inherited habit, untempered by knowledge of the future.

On the other hand, we have a right to dispute the word habit, at all events when dealing with instinct in its higher developed forms or degrees, because the instinct is not absolutely inflexible, not entirely devoid of variation in power. To take an example : It is a fact that certain species of ants which usually build directly on or under the surface, will frequently, when living in periodically flooded regions, build their ant-hill on the top of an old stump which lies so that the water can never reach the summit.

In bygone days we may notice the whole question was settled quite easily, but also, too superficially, *e.g.*, Leibniz felt, in the 17th century, content with the idea that the instinct was a boon to the animals. The Creator has denied them a higher intelligence ; as a compensation the animals were granted a certain " something," an impulse or an instinct. The famous scholastic philosopher of the 13th century, Thomas of Aquino, shared a somewhat similar point of view. According to these views the instinct, of course, is an inexplicable *determinatio naturæ* quite beyond scientific explanation. Jean Lamarck endeavoured, without success, to solve the problem, and Charles Darwin only partly managed to raise a corner of the veil.

The instinct may be subdivided into " the imperfect instinct," and " the perfect instinct."

The first mentioned—the imperfect instinct—includes all manner of instinctive activities which can be improved by training. The play of the animals, and the sucking instinct of the mammals, can be taken as typical instances in that respect.

The perfect instinct, on the other hand, is given to the animal in advance and ready for use ; it cannot, nor will, ever be brought to greater perfection. We are able to quote examples of the perfect instinct by the hundred. The young female cynipide, on breaking out of the gall-nut, has never seen, and will never see, her parents ; but, nevertheless, she will unfailingly lay her eggs when her time comes on exactly the same species of plants as her parents and their ancestors

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did thousands of years ago. The most striking example of a perfect instinct, taken from the life of birds, is perhaps to be found in the wonderful directional powers characteristic of the migratory birds; therefore it cannot astonish us that already some of the very old authors were wonderingly pointing at this great phenomenon; one of the old Jewish prophets, Jeremiah, hints at the mystery some five or six centuries B.C. (*Jer.* 8, 7); and the famous Aristotle, too, mentioned the wonderful instinct of the migratory birds. The mammals, of course, may also exercise actions founded upon the perfect instinct, for instance, when making use of their protecting or concealing colours; unconsciously, the tiger knows that his colour designs are able to camouflage, to blend him with the surroundings—the high grass of the jungle.

We must grant that the limits between the imperfect and the perfect instinct sometimes may be rather vague. To take an instance: When we turn a pup into water, he will drown; whereas an outgrown dog in the same situation will easily save his life by swimming; and, well worth to notice, he will do it equally easily whether or not he has been taught the art of swimming.

Furthermore, the instinct is not always a gift that will last throughout an animal's life: the instinct may be periodic (*e.g.*, the nest-building by birds); or it may be of a transitory character, *i.e.*, not manifested at birth, as, for instance, the nuptial flight of the ants. All instinctive actions of an animal are either directly or indirectly the outcome of an incentive impulse, impelling the animal to maintain the individual, the family, or the species.

As regards the individual, we know that every animal is in possession of the ability to make use of and, unconsciously, master all the means of defence and attack belonging to this particular species, of course more or less perfectly developed according to bodily size, sex, and age of the individual; it is but the natural outcome of the struggle for individual existence.

Concerning continuation of the race, *i.e.*, maintenance of the species, we will take the sexual impulse, thoroughly studied by Darwin. The two determining factors are: firstly, a pure psychological factor, the males preferring certain qualities in the female; and, secondly, a purely physical momentum: the fighting of males amongst themselves in order to acquire the desired female.

The maternal feeling of the animal as an innate instinct is also a more or less unconscious feeling, impelling the mother animal to maintain her family and species; it works for the future, while general self-maintenance, so to speak, more egoistically only keeps the view of pure individual maintenance. We may notice that the maternity instinct

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in the animal world may sometimes be of an emotional nature, but never of a universal character; the animal is only striving to obtain the very best for herself and family. Man only, and when it comes to the point, only the civilised man, can understand that his neighbour's love for his family is fully equal to his own feelings towards his relatives, and equally as well worth respect. From the highest phases of the instinctive forms of action we can now proceed to the real manifestation of the will, the reflection, purpose, and resolution.

The highest intelligence represents the sum total of all those faculties which enable an individual to act in the very best harmony with conditions under review, and by meditation and logical reasoning, abstractly to find the very best answer. The fully intelligent individual can form a train of ideas, and then draw a conclusion; he rises himself superior to the more or less stereotype-instinct being. Probably everyone will agree that the higher animal has consciousness, at all events in the wider sense of the word, and as an accompaniment to the instinct. The mammal has a great surplus of vital energy, and after dealing with the most urgent claims for preserving self and genus, he is able to dispose freely of his power and augment it; acting in different ways, he is able to vary not only the remedies, but also the measures, and he may have an eminent ability to observe, an inquisitiveness, an initiative, and ability to memorise absent objects. If the mammal, therefore, made an error of judgment, he can recall the instance and its result: thus he can derive advantage from the error, and so be prevented from repeating his fault.

But is real reflective power, taking the word in its narrowest sense, to be found in any animal whatever? Are the highest mammals able to form associations of ideas, and are they in possession of the faculty, independent of general impression, to separately focus their attention upon different qualities of any special object? Has any animal the ability to formulate opinions from certain peculiarities noticed in the object under review? We serve a greater and more desirable end in admitting our deficiency of knowledge, rather than trying to produce arguments of questionable value.

URINARY CALCULI.

By W. P. BLOUNT, F.R.C.V.S.

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Introduction.

From the very inception of veterinary science the importance of recognising signs associated with the presence of urinary calculi has been regarded as paramount, inasmuch as similar conditions in

man were known and treated from time immemorial. It is intended in this article to deal especially with the formation of calculi in carnivora, but the general principles outlined may be applied to all animals.

At the beginning of the present century, Fleming (1903) believed that bladder calculi were more commonly met with in the horse than in any other domestic animal. Hutyra and Marek (1926) confirmed this, quoting figures from the Dresden Pathological Institute for the years 1862–1897 inclusive, which indicate that urinary calculi were found in 0.5 per cent. horses, 0.38 per cent. dogs, and 0.22 per cent. cats. It would seem, however that present-day veterinarians, performing an increased number of surgical operations on the dog, are inclined to the view that dogs constitute the most affected animal. Such calculi have become so common that whereas clinical cases were recorded frequently, nowadays, unless exhibiting some special feature, they are considered too commonplace to be mentioned. Hobday (1905 and 1909) records two cases of urethral calculus in a four months' old puppy. The same author found eighty-four stones in one dog's bladder, but the writer believes the latest instance of multiplicity is that recorded by Walker, G. S. (1930), who found over 100 cystic calculi in a dog. The heaviest calculus apparently is one in Dresden, weighing 490 grammes (13.7 ounces).

Although in surgery we have a relatively simple method for the removal of calculi, lithotomy does not prevent their recurrence, or, indeed, their original formation. For prophylactic measures we have to look to the known facts concerning the chemistry and physiology of urine.

Constituents of Urine.

For discussion purposes these may be divided conveniently into: (1) Compounds unassociated with the formation of calculi. (2) Compounds which may participate in such formation; these may be subdivided into (*a*) normal organic constituents; (*b*) normal inorganic constituents; (*c*) pathological urinary constituents.

Banham and Young (1926) state that normal urine contains twice as much organic as inorganic matter.

2. (*a*) Urea.

This is formed in the liver by the deamination of amino-acids; it is capable of forming salts with acids, and crystallising. It forms about 2½–4 per cent. of the urine of all domestic animals (Smith, 1921), the mean excretion in the horse being about 100 grammes *per diem*. The new formula, $NH.CO.NH_3$, appears to agree better with many of its usual reactions, as compared with the older $CO(NH_2)_2$ formula. Urea forms silky four-sided prisms with oblique ends, but if

crystallisation is very rapid, delicate white needles appear. Smith states that when the percentage of urea in the urine is high in the ox, that of the hippuric acid is low, and *vice versa*. About 1/20th of the dog's uric acid is excreted as urea in association with a uricolytic ferment ; the synthesisation of urea into uric acid by *Aves* is a normal procedure. Urea breaks up under ammoniacal fermentation (*see* later).

Uric Acid.

Represents the chief end product of protein metabolism in birds, compared with urea in man. It is synthesised in the liver, and excreted by the kidneys as acid ammonium urate, or alternatively as sodium or potassium urates ; it is soluble in alkalies. In mammals it is derived from nucleo-proteins, which are partially digested by special enzymes in the succus entericus ; the uric acid of birds' excreta is not derived from purine compounds, but from exogenous proteins. Apparently after urea has been formed, birds have the power to synthesise two such molecules with three carbon atoms to form uric acid. *Canidæ* usually oxidise uric acid to form allantoin, but Dalmatians are said to have a high uric acid content of their urine.

Purine bodies, which give rise to uric acid formation, are of three types : (1) methyl purines in tea, coffee, etc. ; (2) free purines, like xanthin and hypoxanthin in meat extracts ; and (3) bound purines, present in cell nuclei, particularly fish, meat (liver, pancreas, kidney, etc.), oats, beans. Eggs are free of purine compounds (Langdon Brown). Contrasted with these exogenous sources of purine, we have those which come from tissue breakdown, leucocytes, etc. Liver extracts are believed to destroy uric acid, since no purines can be found in the blood of dogs so treated after removal of the kidneys (Langdon Brown).

Allantoin.—First found in the allantoic fluid of cattle, it occurs normally in the urine of dogs, cats, and herbivora, forming shiny translucent prisms. Uricase, a ferment present in the kidney, spleen, and liver, brings about the oxidation of uric acid to allantoin. Intracellular ferments (nucleinase, nucleotidases, and nucleosidases) in the intestinal mucosa affect the disintegration of the nucleic acid molecule, so that phosphoric acid, nucleosides, principally pyrimidine, sugar, guanidine, and adenine are absorbed into the portal circulation. Free and combined purines giving rise to uric acid and allantoin finally. Oxidases are distributed variously in animals, xanthine oxidase appears to be absent from the tissues of the rat, and whilst ox liver can form uric acid from both adenine and guanine, dog's liver is unable to use either. The further conversion of uric acid to allantoin

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occurs in most mammals except man, and the higher apes, but in varying degrees, thus :

Uricolytic Indices (Hunter).—Dog, 98 ; pig, 98 ; cat, 97 ; rabbit, 95 ; cow, 93 ; goat, 92 ; horse, 88 ; sheep, 80 ; Dalmatian dog, 32. Hence the high uric acid content of the Dalmatian's urine. This peculiar Dalmatian character is a Mendellian dominant.

Hippuric Acid.—Benzoic acid is a constituent of many vegetables and foodstuffs fed to herbivora, and is not capable of being oxidised by the tissues, hence a protective synthesis mechanism develops. Linkage occurs with glycine (glycocoll : amino-acetic acid) to form benzoyl-glycine (hippuric acid). This is excreted as a potassium salt, and is characteristic of the urine of herbivora. It occurs as four-sided prisms, is odourless, and a monobasic acid. In combination with sodium, it is soluble, and may be found in the liver or kidney. Landois, quoting Schmiedeberg and Bunge (1885), states that when benzoic acid was fed *per os* to dogs, hippuric acid was formed in the kidneys, and excreted as such in the urine. As suckling calves receive no food other than their mothers' milk, no hippuric acid is found in their urine.

Oxalates.—These form envelope-shaped crystals, and are common to many vegetables and fruits. They may also develop from oxidation of the fatty acid series, and rarely from the decomposition of uric acid in the liver, *i.e.*, endogenous oxalic acid. Minkowski believes that once oxalates are absorbed they do not undergo oxidation ; excretion usually occurring in association with calcium.

Cyanuric Acid.—This was believed to be present in the urine of dogs in addition to uric acid and allantoin (Liebig), and as cyanic acid is now known to play an important part in the formation of urea, the chemists of last century were not very far wrong in their belief.

2. (*b*) Ammonia.

During deaminisation, ammonia is liberated from amino acids : some of it combines with acid radicles to form ammonium salts, and as such is excreted in the urine. It forms 4–5 per cent. of the total nitrogen excreted, and the majority of it goes to form urea in combination with carbonic acid. Smith found free ammonia in the urine of the horse and cattle ; Beccari confirmed this : it is assumed that should ammonia be produced in quantities too large for immediate conversion into urea, the small excess passes out into the urine in a free state, or as ammonium salts. Usually sulphates, phosphates, or carbonates are seen to be combined with ammonia in the urine, but ammonium urates and ammonium magnesium phosphates are not uncommon.

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Calcium.—Occurs in the urine of all animals, principally as carbonate, phosphate and oxalate. Smith believes that there is little in the urine of the ox, as most of it is excreted in the large intestines; also that there is an excess in the urine of the horse, causing normal turbidity. It is probable, however, that the hydrogen ion concentration of the small intestines plays no small part in this distribution and excretion. Acids prevent the formation of the more insoluble basic calcium phosphates, and so allow of better absorption. Similarly, once in the blood stream, relatively insoluble tri-calcium phosphate is rendered soluble by the tension of the carbonic acid converting it into calcium bicarbonate, and calcium hydrogen phosphate (Howland). In an examination of the total solids (inorganic) of the horse's urine, Smith found 3.6 per cent. calcium compounds, and Salkowski about 9 per cent.

Phosphates.—Occur in the urine in combination with alkalies (sodium, potassium, and ammonium) as earthy phosphates (calcium and magnesium compounds) and as the triple ammonium magnesium phosphate. Phosphates are derived from proteins, notably phosphoproteins and nuceotides, and are usually found in the urine of carnivora, and the pig; though few are present in horses' urine. If oxidation is incomplete, phosphates may occur in the urine as glycerin phosphorus acid (Sotnitzschewsky).

Chlorides.—Sodium salts are commonest, but potassium, magnesium and ammonium compounds are not infrequently found.

Sulphur.—Sulphur is excreted in three forms: The major portion is seen to be in combination with potassium and sodium, small amounts appear as ethereal sulphates, and occasionally part is excreted as cystin. Ethereal sulphates may be abundant in horses' urine (Smith), and are due to disintegration of proteins containing tyrosine and tryptophane; indol, skatol, and phenol, so formed, unite with oxidised sulphur in the liver, and are excreted inert *via* the kidneys. Cystinuria is apparently due to an inborn error of metabolism, and is derived from cystin, a sulphur-rich amino-acid, especially abundant in proteins present in hair.

Lithium.—Rees believes that lithium is common in the urine of man, being excreted as ammonium and potassium salts.

Silicates.—In association with calcium and magnesium, silica is present in the urine of herbivora (Friedberger and Frohner), also the sheep (Fleming); this is to be expected, since silica is one of the constituents of the wall of plant tissues.

Carbonic Acid.—May be free or combined.

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Iron.—If the drinking water is very rich in iron it may be excreted as carbonate (Furstenburg), although it is usually excreted *via* the large intestine. (*See* paper by Anthony and Co., *Veterinary Record*, XI, No. 31, p. 801.)

Mucin.—Is a gluco-protein containing 12 per cent. of nitrogen, and 2 per cent. of sulphur.

Pigments.—The normal colour of the urine is due to urochrome (Thudichum), but in some cases this may be oxidised to uroerythrin. Urobilin, or its chromogen urobilinogen, may be present in some cases. If the diet is rich in tyrosin, pyrocatechin may also discolour the urine: it is an oxidation product of phenol.

Types of Urinary Calculi.

These are of two kinds, and depend upon the reaction of the urine, thus:

(1) *Acid Urine Deposits.*—(*a*) Biurates of soda and potash; (*b*) uric acid; (*c*) oxalates; (*d*) cystin, leucin, tyrosin, lithium; (*e*) silicates; (*f*) tribasic calcium phosphate.

(2) *Alkaline Urine Deposits.*—(*a*) Tribasic calcium phosphate; (*b*) triple phosphorus of ammonium, magnesium; (*c*) acid ammonium urate; (*d*) calcium carbonate; (*e*) neutral calcium phosphate; (*f*) calcium and magnesium phosphates; (*g*) lithium salts, leucin, and tyrosin. The following table gives the chief constituents of urinary calculi as found in animals:

	Acid.	*Alkaline.*
Horse.	Silicates.	Triple phosphates.
		Calcium carbonate.
		Magnesium phosphates.
		Calcium phosphates.
Ox.	Silicates.	Calcium, magnesium phosphates.
	Calcium oxalates	Calcium and magnesium carbonate.
	Xanthin (Joest)	Triple phosphates.
		Carbonate of iron.
Sheep.	Silicates.	Triple phosphates.
		Carbonate of iron.
		Calcium, magnesium phosphates.
Pig.	Silicates.	Triple phosphates.
	Calcium oxalate.	Calcium carbonates.
Dog.	Calcium oxalate.	Triple phosphates.
	Ammonium oxalate.	Calcium carbonate, phosphate.
	Cystin.	Acid ammonium urate.
	Uric acid.	
	Urates.	

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Cat.	Cystin (Roell)	Calcium carbonate and phosphate.
	Uric acid.	Potassium, magnesium phosphates.
	Calcium oxalate.	Triple phosphates.
Man.	Calcium oxalate.	Triple phosphates.
	Uric acid.	Calcium phosphates.
	Urates.	Lithium compounds.
	Cystin.	

It will be seen that triple phosphates are common to all animals, and are present in the majority of calculi deposited in alkaline urines. Organic compounds are seen to be a part of calculi found in the urine of flesh eaters ; whilst earthy phosphates and carbonates are common to the herbivora.

Uratic Calculi are small, hard, yellow, or reddy-brown, due to the presence of uroerythrin ; they have a smooth surface, are friable and are composed of concentric strata.

Cystin containing Calculi are yellow, turning to green on exposure to daylight ; they are soft (waxy), friable, and have a shiny, irregular crystalline surface.

Oxalic Calculi are hard, heavy, and brownish tinted. They have usually irregular mulberry surfaces, but sometimes may be smooth.

Phosphatic Calculi are grey, white, smooth, soft, and friable.

Calcium Carbonate Calculi may be seen as fine, yellowish, sandy-looking deposits ; the colour varies with the type of pigment present.

Controlling Factors in the Reaction of the Urine.

Owing to the fact that certain urinary constituents become insoluble when their surrounding media alter its reaction, and thus become potential sources of origin of calculi, it is highly important to understand the mechanism which controls this reaction.

Fourcroy and Vauquelin, in 1798, showed that ammonia formed during the alkaline fermentation of urine had its origin in the urea. In 1864, von Tieghem isolated the causal organism of this change ; it has since been called *micrococcus ureæ*. Many other organisms are also capable of decomposing urea with the formation of ammonia, and Miquel, in 1890, proposed the use of the term urease to indicate the ferment common to all such organisms. Urease is, however, not restricted to the animal kingdom, because it is found in many leguminosæ, notably the beans—*Glycine hispida* (Soya bean)—and several species of *Canavalia*. Its presence in small amounts in the liver of the horse and dog may be due to ingestion. When such fermentation occurs in the urine it is followed in many instances by the formation of " triple phosphates " : ammonium, magnesium phosphate, a

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common source of concretion for calculus formation. The normal method for ensuring that the urine shall be alkaline is in part controlled by the kidney itself, and in part by the type of food ingested. Ammonia is present in the urine in small amounts as a direct supply from the deaminisation of amino-acids, because it is considered that such ammonia has been excreted before it has had time to become transformed into urea by the liver. The urine of herbivora is alkaline because their foods contain large quantities of tartaric and citric acids; these become completely oxidised during metabolic processes, and their alkaline bases are excreted. If, however, a herbivorous animal were starved and had to derive its nourishment from its own tissues, then an acid urine would result, due to the excretion of acid sodium and potassium phosphates, etc.; these are derived from the proteins, and this type of acid urine is normally present in all carnivora.

The hydrogen-ion concentration of the blood is maintained partly by the activity of the respiratory centre, and partly by the kidneys. During the metabolism of animal protein, sulphur and phosphorus compounds are being oxidised with the production of their respective acids: these are later excreted, and so tend to lower the pH blood. The kidney has the power, therefore, of excreting varying proportions of acid and alkali sodium phosphates in its endeavour to maintain a steady pH of the blood. If urine is allowed to stand, acidity may occur due to the presence of a fungus *Saccharomycetes*, or to the absorption of O_2 (Pasteur), or CO_2. Also, if the urine contains lactose (as in pregnancy), or glucose (physiological or pathological), acidity may follow due to the formation of lactic acid by ferments.

Factors Associated with the Production of Urinary Calculi.

The word "calculus" is rather misleading, since concretions of stonelike consistency to which the term lithiasis refers, may vary considerably in size. Numerous small sand-like deposits are often called "gravel"; when there are few, but of larger millet-seed to walnut size, the term "stone" is commonest; and when single and very large, calculus may be referred to. As urinary concretions, they may be present in any part of the excretory system, namely, pelvis or kidney, ureter, bladder, terminal ducts of prostate, or urethra; their actual site depends largely upon physical factors. These are: (*a*) the presence of a nucleus; (*b*) the rate of flow of the urine; (*c*) kinks in the ureter; (*d*) the width of the lumen of the urethra; (*e*) presence of an *os penis*; (*f*) effects of gravity, etc. It was suggested that the predilection seat of calculi in the bladder of man, as compared with the kidney of the horse, was due to the pull which is exerted by gravity on the flow of the urine (Dick); but as the dog also adopts the horizontal

position, like the horse, and has most calculi in the bladder, this explanation hardly appears to hold good.

The following are the supposed chief factors which control the formation of a calculus: (1) The reaction of the urine; (2) presence of a nucleus; (3) excess of foods rich in salts and organic compounds; (4) metabolic disturbances associated with abnormal excretion of salts.

(1) It is clear that although the reaction of the urine plays an important part in the formation of calculi, it cannot by itself be considered the primary factor, since phosphates will always be deposited in alkaline urine; yet it is hardly to be expected that all animals with an alkaline urine will present urinary calculi. It is known, however, that the alkaline (ammoniacal) fermentation associated with the presence of micrococcus urease is practically characteristic of inflammatory conditions of the bladder; and, further, Ebstein's experiments demonstrated that inflammatory processes predispose to calculus formation, due to the ease with which organic matter is liberated, and which can act as nuclei.

(2) In order to produce concretions of material, it is necessary to have either: (*a*) a solid nucleus around which future insoluble material will (coalesce) aggregate, or which will act as a crystallising point for the precipitation of material in solution; (*b*) a suitable medium to coalesce the sedimentary particles, so to glue together the insoluble particles, and thus form the calculus. Once a concretion has formed it is probable that, although the urine may be normal in its constituents, and in their respective proportions, deposition of salts will still occur on that nucleus.

Further, if from a saturated solution the dilurent is gradually removed by evaporation, the solid is generally deposited in crystalline form (Dupré and Hake). It is not difficult to see how this may occur in the urine, because although evaporation can scarcely occur, reabsorption of part of the water content takes place physiologically *via* the kidney tubules. Should this occur crystals would form, and if suitably massed together could conceivably "start the ball rolling."

In both normal and pathological urines it is possible to demonstrate gelatinous substances like albumins, mucus, globulins, etc., which can presumably coalesce fine particles. Mucus is predominant in the urine of the horse, being frequently mistaken by the layman for something of pathological significance. Physiological albuminuria occurs after severe exercise (racing, ploughing, etc.), cold bathing (falling into rivers, ponds, etc.), and also during pregnancy. *B. coli* infection of the kidney may also cause inflammatory colloids, *i.e.*, glue. It

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must be understood that the reaction of the urine will vary from day to day according to the diet, amount of exercise, etc., so that it is usual to find calculi composed of more than one type of substance, different layers being added under suitable environment.

Types of Nuclei.—Normally there are present in urine epithelial cells from the lining mucosa, which, with the possible presence of spermatozoa, may form nuclei. If inflammatory states exist (Shade believes they are an actual necessity before calculi can form), kidney casts, pus, blood cells, and fibrin may exist in the urine, any of which could form a nucleus. Certain parasites may be excreted by the kidney, and they, or their eggs, form nuclei. Chief amongst these are : *Eustromgulus gigas* (*Dictophyme renale*) of the renal pelvis of the dog, horse, or cow. *Tænia serrata* of the pelvis of the dog (Wolpert). *Strongylus penguicola* of the pig. *Coccidia* of the goose. Bacteria associated with pus or inflammation are usually held to be suitable as nuclei.

(3) It has naturally been supposed that animals which are fed on foods abundant in earthy salts, or animal protein, are more liable to calculus formation because there will be a concomitant heavy excretion of such salts in the urine. It is further necessary to understand that animals which drink waters with excess salts, so-called "hard waters," may also be predisposed to calculus formation. However, there is little data available relative to this aspect of the subject.

(4) Because the three preceding causal factors may exist in normal animals, it has been postulated that a further factor is necessary for calculus formation, namely, that of disordered metabolism. Exactly what this means, no one has specifically defined, but apparently it involves the endocrine system. It certainly is known that ductless glands exert an influence over the metabolism of organic and inorganic salts. The parathyroid, suprarenal, pituitary, and gonads are all known to be associated with calcium metabolism, and also act reflectively, if not directly, on the metabolism of phosphorus. Langdon Brown found that thyroid tissue fed to a cat diminished its production of bile salts, and this influenced alkali metabolism. The pituitary is well known in connection with the polyuria of *diabetes insipidus*. The thymus and thyroid affect the production of leucocytes, and hence will assist the nucleo-protein metabolism. Vitamins may also be involved, since vitamin D is related to rickets, and vitamins A and B with growth. Landois believes that calculi of the kidney occur without a true nucleus, and as such may pass to the bladder ; he infers that a gluing of amorphous masses may take place in acid urines, but calculi originating in the bladder in alkaline urines do have a nucleus.

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Prophylaxis.

It is now possible, having studied the chemistry and formation of urinary calculi, to suggest methods for their prevention. These may be :

(1) *Dietetic.*—Avoid " hard " waters if practicable, or attempt to render them " soft " by one of the following means (Linton) : (*a*) Boiling to precipitate calcium and magnesium carbonates (temporary hardness) ; (*b*) add slaked line to precipitate calcium carbonate, and if excess is added, then magnesium carbonate will also be thrown down, as will iron and manganese salts and organic material ; (*c*) add sodium carbonate to precipitate the sulphates and chlorides of calcium and magnesium.

Avoid excess foods containing large supplies of inorganic salts : thus bran, grains, cereals, cotton-seed meal, and fish meal are rich in phosphorus. Peas, beans, clovers and fish meal contain much lime. Certain grasses are abundant in silica. Animal proteins are rich in sulphates and phosphates ; fish contain phosphates, and beet and potatoes have both potash and silicates. Calcium phosphate is one of the major mineral constituents of bone meal.

Linton suggests that mangolds cause urinary calculi in sheep, but this is in opposition to the findings of Pontius *et alia* as recorded in the *Journal of Agricultural Research.* From data gathered during a period of fifteen years (covering 230 cases), these authors find that twice as many calculi occurred when roots were not a component of the animals' ration, and that the feeding of roots to rams over a period of several months did not lead to calculus formation. It was asserted that the disease was more prevalent in winter months when considerable amounts of grain were fed, but if conditions in Canada and U.S.A. are as in this country, the quantity of roots fed to cattle is also increased during the winter months. When roots were fed, the amount of urine passed was about $4\frac{1}{3}$ pints daily, whereas when dry foods were allied this quantity fell to less than half a pint. The authors formulate the hypothesis that when the ration is lacking in succulence, and is composed of feeds producing insoluble mineral compounds, the urine becomes concentrated, and retention is likely to occur. This condition allows urease sufficient time to form ammonium salts, and is conducive to the production of crystals which may become sufficiently large to block the urinary tract.

A further value of dietetic prophylaxis concerns the reaction of the urine, whereby a medium may be produced which will be antagonistic to calculus formation. Acid sodium phosphate, calcium or am-

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monium chloride administered *per os* all possess the power of reducing the hydrogen-ion concentration of the urine, and so rendering it acid. Dryerre reduced the pH value of the urine of students (on normal diet) as low as pH 4.5 by giving calcium chloride in tablespoonful doses daily. Cereal grains and bran tend to make an alkaline urine neutral (Pontius). To render urine alkaline, administer magnesium salts (chloride, hydrate, etc.), potassium citrate, alkali carbonates, tartrates, alfalfa, or mangolds. Fresh fruits are said by Jerome Smith to check high acidity.

General Prophylaxis.

When cases are encountered, the following suggestions as to prophylaxis may be studied: *Exercise.*—This should be regulated so that it is neither too severe, which could cause albuminuria; nor too restricted so that retention of urine takes place.

Inflammatory Lesions.—If any inflammatory state exists in the urinary tract, endeavour should be made to reduce this. Urinary antiseptics like hexamine (active in acid urine only), helmitol (similar in action to urotropine, but effective only in alkaline urine), caprokol, salicylates, copaiba, buchu, cubebs, turpentine, etc. Should hexamine be given shortly after a meal (half to two hours afterwards), there is the possibility that the gastric acidity would evolve formaldehyde before the hexamine had had time to be absorbed and excreted into the urine. It will be appreciated that calculi with smooth surfaces are less liable to cause irritation than those with sharp or irregular edges. The ammoniacal fermentation of urine associated with its retention, is a frequent cause of cystitis, and impresses one with the fact that adequate micturition is fundamental. Hyperacidity in carnivora is not uncommon, and as this tends to raise the pH of the urine even to the alkaline side of neutrality, such an abnormality should be corrected. A rich fatty (cream) diet may be tried (*see* "Abstract on Fat").

Body Wasting allows the utilisation of tissue proteins with the formation of endogenous purine and consequent greater excretion of phosphates. Easily digested food to build up the animal's strength is indicated. *Functional albuminuria* should be corrected by giving calcium lactate; but, of course, in true nephritis calcium has no effect. *Liver abnormalities* should be attended to, since hepatic affections give rise to an increased excretion of hippuric acid (Zulzer). *Chloroform anæsthesia* increases the excretion of phosphates, and morphia that of urea, neither of which, therefore, are desirable. *Gastric catarrh* is often associated with oxaluria, and should be corrected in the dog.

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Pharmacology.

The value of drugs which are believed to act by resolving urinary calculi, so-called lithontriptics, has always been doubted. Once the calculus has formed, in nearly every case surgical interference is indicated, but certain drugs have value as preventives. In addition to giving internal antiseptics for the correction of cystitis or other inflammatory processes of the urinary tract, local syringing is valuable. Such substances as mercuric chloride, mercurophen, neo-protosil, silver nitrate, alum, fecto, carbolic acid, Lugol's solution, with or without adrenalin, and/or some analgesic (the value of carbolic in this respect cannot be over estimated) may be used.

Ammonium benzoate is said to help the resolution of phosphatic deposits in sheep. *Sodium bicarbonate*, 8–60 grains prevented phosphatic urinary gravel in lambs (Moussu). *Turpentine*, in addition to its antiseptic properties, is recommended by Hutyra and Marek to expel eustrongyle parasites. *Thyminic acid* holds uric acid in solution (Minkowski), and could be tried. *Whey* is said to prevent uric acid deposits. *Cholalic acid* prevents cystin calculi, and alkalies help to dissolve them, since endogenous cystin forms taurin of bile salts. *Magnesia* is valuable in oxaluria, since it renders oxalates more soluble; in this respect peas are excellent, being rich in magnesium salts and poor in oxalates. *Potassium citrate* combines with calcium and thus prevents the formation of calcium oxalate; in addition it is a diuretic. *Acid sodium phosphate* by acidifying the urine also helps in the solution of oxalates; Maguire found it to diminish their size. *Quinine* diminishes the excretion of urea and urates.

Conclusions.

If it be granted that there is not in animals suffering from urinary calculi any one specific factor associated with their formation, the veterinary practitioner may consider that he has several associated factors which he can control to a very large extent. This means that he should be able to assist the animal to prevent recurrence of calculus formation. If the reaction of the urine is not what usually exists in the species of animal under investigation, then the practitioner should make the correction of this his first duty. Medicinal methods may be necessary, but the diet factor is equally important. Realising that the majority of calculi are concretions formed around a nucleus, and that such nuclei are commonly associated with debris from the products of inflammation, the practitioner should attempt rigid antisepsis of the urinary tract. Further, if the diet, both fluid and

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solid, be unnatural either in quality or quantity, this should be rectified, avoiding unbalanced foods, and restricted water supplies, etc.

Lastly, it is essential that the general body health of the animal be as near normal as practicable. All abnormalities, like endocrine disorders, gastro-intestinal troubles, wasting, excessive deposition of body fat, retention of urine, should be corrected. Lithontriptic or other medicinal agents may be necessary to complete the prophylactic picture.

Summary.

(1) The constituents of urine concerned in the formation of urinary calculi are discussed at length. (2) Types of calculi, their character, formation and composition are noted. (3) Preventive measures which may be adopted are outlined.

It would not seem unreasonable for practitioners to send to suitable laboratories examples of calculi removed from animals by operative methods, for analytical purposes. Data concerning the physical characters, chemical composition, type of nucleus, etc., of calculi are far from complete, so that if it is possible to associate certain clinical symptoms with definite types of calculi we shall have progressed in our science. When practicable it is obviously valuable for surgeons to tabulate notes on calculus incidence, including as far as possible : (1) Clinical signs concerning frequency of passage of urine, with or without hæmaturia ; (2) size and shape, number, and colour, etc. ; (3) rapidity of recurrence ; (4) diet, exercise ; (5) associated pathological states, cystitis, gastritis, etc. ; (6) age, sex, and breed of animal.

A few weeks ago a most interesting paper on " Bladder Calculi " was published by McCarrison in the *British Medical Journal*, No. 3675, p. 1,009, dealing with the subject as found in India. The paper gives valuable clinical and experimental data, including observations on calculi of bovines. These are some of his findings :

Whole wheat is readily associated with calculus formation, far more so than ordinary white flour. Vitamin A is absolutely necessary to prevent urinary calculi ; an imbalanced Ca-P balance, particularly excess of lime, aids calculus formation.

Nuclei in man are frequently composed of uric acid and urate crystals. No uric acid stones are found in the rat, as purines are oxidised to allantoin, as with cattle.

In cattle calculi appear as small, round, shot-like bodies composed entirely of $CaC0_3$, with a small amount of magnesium.

Vitamin A assists the solution of calcium deposits, and if deficient can cause cystitis. Cystitis is not a necessary precursor of ammonium-magnesium-phosphate calculi.

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REFERENCES.

(1) Bainbridge and Menzies: "Essentials of Physiology," 6th ed., p. 459. 1929. London: Longmans, Green & Co.
(2) Baldwin, quoted by Langdon Brown, p. 210.
(3) Banham, G. A., and Young, W. J.: "Veterinary Posology," 5th ed., p. 298. 1926. London: Bailliere, Tindall & Cox.
(4) Bert and Strudensky, quoted by Muller and Glass, p. 176.
(5) Brown, W. Langdon, : "Physiological Principles in Treatment," 5th ed. p. 191. 1924. London: Bailliere, Tindall and Cox.
(6) Brumley, O. V.: "Diseases of the Small Domestic Animals," p. 421. 1922. London: Bailliere, Tindall & Cox.
(7) Dick, William: "Manual of Veterinary Science," 2nd ed., p. 46. 1862. Edinburgh: Adam and Charles Black.
(8) Dryerre, Henry: Private Communication, 1930.
(9) Dun, Finlay: "Veterinary Medicines," 12th ed., p. 128. 1910. Edinburgh: David Douglas.
(10) Dupré and Hake: "Short Manual of Inorganic Chemistry," 2nd ed, p. 219. London: Charles Griffin, 1892.
(11) Fleming, G.: "Text-book of Operative Veterinary Surgery," (edited by J. MacQueen), 2nd ed., p. 457. 1903. London: Bailliere, Tindall and Cox.
(12) Friedberger and Frohner: "Veterinary Pathology," Vol. I, 6th ed., p. 344. 1908. London: Hurst and Blackett.
(13) Furstenberg, quoted by Steel, J. H.
(14) Greig, J. Russell: "Veterinary Materia Medica and Therapeutics," 4th ed., p. 111. 1924. London: Bailliere, Tindall and Cox.
(15) Hewat, A. F.: "Examination of the Urine," 6th ed. Edinburgh: E. and S. Livingstone. 1921.
(16) Hobday and Shepherd: VETERINARY JOURNAL, p. 91. 1905.
(17) Hobday, F. T. G.: "Surgical Diseases of the Dog and Cat," 3rd ed., p. 301. 1924. London: Bailliere, Tindall and Cox.
(18) Liebig: Quoted by Landois, p. 451.
(19) Howland: Quoted by Wright, Samson, p. 132.
(20) Hunter and Givens: *Journ. Biol. Chemistry.* 1914. XVII, 37.
(21) Hutyra and Marek: "Special Pathology and Therapeutics of the Diseases of the Domestic Animals," 3rd ed., p. 62, Vol. III. 1926. London: Bailliere, Tindall and Cox.
(22) Kirk, Hamilton: "Diseases of the Cat," p. 270. 1925. London: Bailliere, Tindall and Cox.
(23) Lancefield: *Journ. Exp. Medicine.* 1925. Vol. XLII, pp. 377, 397.
(24) Linton, R. G.: "Veterinary Hygiene." 1921. Edinburgh: Green.
(25) Linton, R. G.: "Animal Nutrition and Veterinary Dietetics," p. 30. 1927. Edinburgh: Green.
(26) Lowson, J. M.: "Text-book of Botany." 1908. London: University Tutorial Press.
(27) Maguire: *Proceedings of the Royal Society of Medicine* (*Medical Section*). Vol. III, p. 1.
(28) Minkowski: Quoted by Langdon Brown, p. 211.
(29) Muller and Glass: "Diseases of the Dog," p. 176. 1908. London: Bailliere, Tindall and Cox.
(30) Parsons, T. R.: "Fundamentals of Biochemistry." 1923. Cambridge: W. Heffer and Sons.
(31) Paton, D. Noel, and Orr, J. Boyd: "Essentials of Veterinary Physiology," p. 561, 3rd ed. 1920. Edinburgh: W. Green.
(32) Porter, J.: "Stockfeeders' Companion," p. 82. 1915. London: Gurney and Jackson.
(33) Pryde, J.: "Recent Advances in Biochemistry." 1926. London: J. and A. Churchill.
(34) Rees, G. Owen: "Urinary Diseases," 2nd ed., p. 67. 1845. London: Longman, Brown, Green and Longman.
(35) Reid and Hobday: VETERINARY JOURNAL, 1909. p. 351.
(36) Rose: "Purine Metabolism," *Physiological Reviews*, 1923, III, p. 544.
(37) Salkowski: Quoted from Ellenberger's "Physiologie."
(38) Schniedeburg and Bunge: Quoted by Landois, p. 541.

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(39) Short, A Rendle, and Ham, C. I.: "Synopsis of Physiology," p. 110. 1927. Bristol: J. Wright and Sons.
(40) Smith, Sir F.: "A Manual of Veterinary Physiology. 5th ed., p. 337. 1921. London: Bailliere, Tindall and Cox.
(41) Smith, Jerome: Quoted by Langdon Brown, p. 203.
(42) Sotnitzschewsky: Quoted by Landois.
(43) Steel, J. H.: "Diseases of the Ox," 3rd ed., p. 362. 1890. London: Longmans, Green and Co.
(44) Thudichum: Quoted by Landois. Walker, G. S., *Veterinary Record*, p. 193, 1930.
(45) Werner: "The Chemistry of Urea." 1923. London: "Longmans, Green and Co.
(46) Williams, W. and W. O.: "The Principles and Practice of Veterinary Medicine," 9th ed., p. 883. 1909. London: Bailliere, Tindall and Cox.
(47) Wohler, v. Frerichs: Quoted by Landois.
(48) Wright, Samson: "Applied Physiology," p. 378. 1926. London: Oxford University Press.
(49) "The Horse," p. 218. London: W. Clowes, Stamford Street, *circ.* 1820.
(50) Landois and Stirling: "Text-book of Human Physiology," Vol. II. 1885. London: Charles Griffin and Co.
(51) Pontius, *et alia*: *J. Agri. Research*, 1931, LXII, 433. (Abstract *Vet. Record*, XI, No. 26, p. 698, 1931.)

Clinical Articles

Atypical Cases of Equine Epizöotic Lymphangitis.

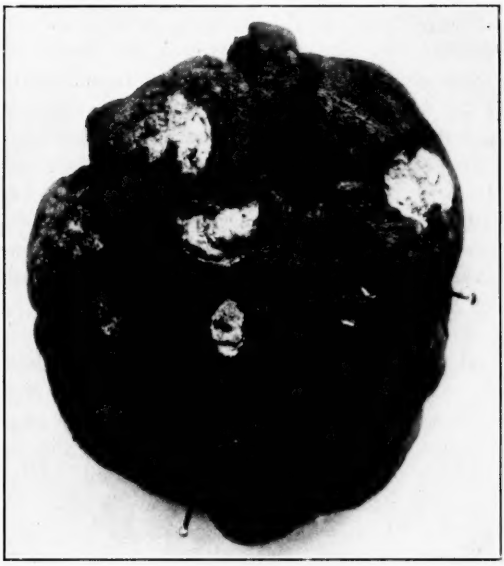
By R. PAINE, F.R.C.V.S.

Grahamstown, South Africa.

ACCORDING to most authorities the lesions of equine epizöotic lymphangitis are noted upon the inner parts of the limbs, the withers, the back, breast, sides, metacarpal and metatarsal regions of the limbs, and all authorities consider the infection to have originated through wounds frequently connected with direct injuries caused by harness, whips, spurs, etc., or through the agency of flies. According to Edmonds, ticks were first incriminated by Henning as a cause of the initial lesions; this view was supported by Jarvis. Most observers connect the presence of a distinct cording of the adjoining lymphatics as typical of the disease: no one appears to have noted the presence of one or more isolated sores of long-standing without any appreciable cording of the lymphatics in the neighbourhood.

In February, 1929, a farmer reported that his horse had been suffering for a long time with a sore on the point of the sheath in spite of treatment; microscopic examination disclosed epizöotic lymphangitis. The animal was seven years old, in splendid condition, and apart from the one sore, apparently in perfect health. As the owner suggested

that many similar cases existed in the neighbourhood, stock inspectors were instructed to examine all equines in their respective areas, and to submit scrapings for examination from all sores discovered. During the subsequent eighteen months, fifty-seven definite cases were detected in the four adjoining districts, of which the following is an analysis: Isolated lesions upon the udder sheath or penis, without any apparent cording of the lymphatics in twenty-seven cases. Numerous lesions with more of less cording between the fore and



Typical isolated lesions on the prepuce.

hind legs, only twenty-nine cases. Lesions on the sheath between the legs, and one closed lesion on the point of shoulder, one case. A considerable number of these cases would have been overlooked or attributed to mere injuries caused by ticks had not special instructions been issued that material from all such lesions was to be secured for examination purposes. The suggestion arises that possibly in tick-infested areas the disease is much more prevalent than is generally realised; further, that ticks do take an active part in its transmission.

Attached photograph of typical isolated lesions on the sheath of a horse.

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Treatment of Micro-Filaria in Horses.

By MAHOMMAD MALIK, B.Sc., M.R.C.V.S.
Civil Veterinary Department, Bihar, India.

A GREY C.B. pony, eight years of age, 13.1½ hands in height, used in hackney carriage, being very debilitated, and with both the hocks anchylosed, was prosecuted under the Prevention of Cruelty to Animals Act by the Veterinary Assistant Surgeon in charge of one of the district hospitals, and was kept there for treatment. Blood smears were sent to the North Bihar Range Laboratory, and a few micro-filaria were found in it. As there is a small experimental station attached to the laboratory, the pony was purchased from the owner, and was admitted to the experimental station on August 20th, 1929, with the following symptoms: Condition miserable, marked emaciation, hide-bound, the skin of both the shoulders, sternum, and the chest wall of each side was completely devoid of hair, exposing the skin with formation of scales; weak in the loins, anchylosis of both the hock joints, staggering gait. Though dull and depressed, the appetite was good, visible mucous membranes anæmic, body temperature 101.4°F.; fæces and skin scrapings on microscopical examination gave negative results.

The pony was segregated, and kept on crushed oats and green grass. Blood from periphery in wet smears was examined, and the micro-filaria were counted at different hours during the day and night, but practically no variation in their number was found, though Lingard considers the evening hours from six to ten the time for the maximum number to appear, with a less important maximum a few hours earlier. An attempt was made to transfer filariasis to horses and dogs by the intravenous and subcutaneous injections of blood containing micro-filaria from this case before any treatment was adopted, without success.

As literature available on the subject was very meagre, especially that dealing with treatment, attempts were made to find out the toxicity of various common parasiticides on these organisms. For the purpose a fair quantity of blood was drawn from the jugular vein of the pony, and 10 per cent. solution of potassium oxalate was added to it to prevent coagulation. The blood was then transferred to four tubes, each containing 10 per cent. of oxalated blood (9 c.c. of pure blood, and 1 c.c. of 10 per cent. solution of pot. oxalate). Out of these, one tube was kept as control, and to the rest were added solutions of tartar emetic (tube No. 1), five drops of 1 per cent. solution; trypan blue (tube No. 2), five drops of 1 per cent. solution; and nagano (tube No. 3), five drops of 10 per cent. solution. Smears

were made from these tubes at regular intervals of two hours, and the distribution and mobility of the M. filarias examined, with the following results :—

Sept. 10th, 1929.—4.30 p.m. Tube No. 1—5 drops of 1 per cent. sol. of tartar emetic was added. Tube No. 2—5 drops of 1 per cent. sol. of trypan blue was added. Tube No. 3—5 drops of 10 per cent. sol. of naganol was added. Tube No. 4—control.

5 p.m. On examination of the wet smears separately from all the four tubes the movement of the M. filarias was found almost the same in all the tubes.

7 p.m. No M. filariæ was found alive. The motility of the M. filarias in tubes Nos. 2 and 3 was more or less the same as that of the control tube.

7.30 p.m. Tube No. 1—nothing was added to it. Tube No. 2—5 drops of 1 per cent. sol. of trypan blue was added. Tube No. 3—5 drops of 10 sol. of naganol was added. Tube No. 4—control.

9 p.m. Tube No. 1—no M. filariæ was found alive. The M. filarias of all the three tubes were not so lively as before, they were a bit sluggish, though they were wriggling about.

9.30 p.m. Tube No. 1—nothing was added to it. Tube No. 2—5 drops of 1 per cent. sol. of trypan blue was added. Tube No. 3—5 drops of 10 per cent. sol. of naganol was added. Tube No. 4—control.

September 11th, 1929. 7 a.m. Tube No. 1—no M. filariæ was found alive. The M. filarias of all the three tubes were found still alive, though they were markedly slow and dull in their movements.

9 a.m. Tube No. 1—No. M. filariæ was found alive. The M. filarias of all the three tubes were found still wriggling about, though the movements were gradually becoming slower and slower.

11 a.m. No M. filariæ was found alive in any of the four tubes.

As this pointed to the fact that tartar emetic was the most toxic of all the remedies which we had tried, it was decided give a trial to this drug.

Accordingly, on September 17th, 1929, 10 grains of pot. antimonium tartaratum in 10 c.c. of sterile distilled water was injected into the jugular vein. On the next day only eight micro-filaria were found in the wet smears made from the peripheral blood, against fifty-eight just before the injection. On the subsequent two days there were only four in number in the wet smears.

September 20th, 15 grains of pot. antimonium-tartaratum in 15 c.c. of sterile distilled water were injected. September 21st : No micro-filaria were found in the wet smears prepared from the peripheral blood.

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September 23rd and October 1st: Two more doses of pot. antimonium-tartaratum, 15 grains in 15 c.c. of sterile distilled water were injected. No micro-filaria reappeared since their first disappearance till this date, April 14th, 1931, though the blood and spinal fluid were examined on several occasions.

It may not be out of place to mention here that the body temperature was almost all along slightly above normal since the pony was admitted to the experimental station, but it came down to normal on the disappearance of the micro-filaria in the blood.

Most of the parts which were devoid of hair are now covered with normal hair, with the exception of a portion of the near side chest wall, though no special attention was paid or any medicine applied to it.

BIBLIOGRAPHY.

Hutyra and Marek: "Special Pathology and Therapeutics of the Diseases of Domestic Animals." Vol. 3, p. 169.
Underhill: "Parasites and Parasitosis of Domestic Animals," Chap. 20, p. 244.
E. Wallis Hoare: "System of Veterinary Medicines," Vol, 2, p. 1558.

Notes on an Outbreak of Infectious Abortion.

By LL. E. W. BEVAN, M.R.C.V.S.
Director of Veterinary Research, S. Rhodesia.

In August, 1930, a serious outbreak of infectious abortion was reported in a valuable dairy herd on a farm in the vicinity of Salisbury, Southern Rhodesia. The owner was unable to state definitely how many cows had aborted, but at the time he sought assistance abortions were occurring almost daily, and the absence of calves indicated that the infection was well established in the herd.

The farm was divided up into a number of paddocks, but the cows ranged almost promiscuously over the whole of them, and were dipped at one tank, and drank out of a common water-trough. They were stabled in two large milking-sheds, dry and milking cows being mixed indiscriminately. At that time a milking machine was in general use, but a few special cows were milked by native attendants. Two pedigree Ayrshire bulls had been allowed to run with the herd on alternate days, but only one was then in use.

The position at first sight appeared to be beyond control, but it was decided to ascertain the extent of the infection by testing the whole herd, and on August 16th, seventy cows and one bull were tested by the "abortoscope" method. The results of these tests, which are shown in the table, indicated that thirty-one cows and the bull were clean, and thirty-nine cows were infected.

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It was then decided to divide the herd into a clean and an infected troop, the former continuing to occupy one of the sheds, the latter being grazed in a separate camp, but returning to the second shed for milking. What was done with the milk from the latter, history does not relate, but instructions were given that it should not be used for human consumption, and only for animals after boiling. More effective isolation could not then be arranged, and there appeared to be little prospect of success in view of the fact that the herds constantly passed over the same ground and continued to drink from the same water-trough, disadvantages which were unavoidable owing to the crowded state of the farm. No bull was allowed to run with the infected herd. In order, therefore, to hasten herd-immunity, the infected troop was inoculated with the so-called " devitalised vaccine " issued by the Veterinary Research Department, and consisting of cultures of local strains of *B. abortus* destroyed by exposure to chloroform. On August 26th, thirty-eight infected cows were inoculated (the thirty-ninth having died during the interval), but the clean cows were not inoculated for fear that the vaccine reaction might complicate the agglutination test.

On October 27th, the owner's son tested sixty-nine cows with the " abortoscope," and found the thirty-one original clean animals still negative. Four of the thirty-nine infected animals had aborted since the first test, and one had died. Two of them now gave a negative reaction, and were returned to the clean herd. On October 29th, the thirty-six infected animals were again inoculated with the " devitalised vaccine," and it may here be mentioned that after this second injection no further abortions occurred. On January 8th, 1931, the infected herd was again tested by the owner by the " abortoscope " method, and thirty-three were still found to be positive. Three yielded a negative reaction, and were returned to the clean herd. On February 19th, the test was again applied, and eight of the previously positive animals were now found to be negative, five yielded doubtful reactions, and twenty were still positive. The infected herd was again tested on March 29th, and three cows yielded a negative reaction, and twenty-two remained positive.

The owner, in a spirit of optimism, then decided to abandon the isolation, and again mix the two herds, allowing the bulls to run promiscuously with them.

On August 13th he visited the laboratory to report that five of the previously infected cows had given birth to healthy calves, ten were heavy in calf, two others were probably in calf, and three appeared to be empty. No abortions had occurred since the second

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inoculation, in spite of the fact that clean and infected animals had been in constant contact during the past five months.

The interesting feature in connection with this outbreak is the success which has been achieved in spite of almost overwhelming difficulties. Although partial isolation was adopted, little good was expected of it, as clean and infected animals were compelled to pass over the same ground daily on their way to water or to their respective paddocks. The fact that none of the original negatives became infected is remarkable, and indicates that the infection was in some way associated with close contact in the byres. The usefulness and rapidity of the "abortoscope" method of testing and the accuracy of the results have been clearly demonstrated. Most of the testing has been carried out by the owner's son, and the results have been most consistent. The last test, on August 24th, was carried out by two of the members of the Veterinary Research Department Staff. Twenty-five animals were tested as they stood in the byres, with the native milkers holding their heads, in just under one hour. These animals, having been tested so frequently, resented further cutting, and were by no means easy to control.

In view of the general condemnation of "dead" vaccines, one hesitates to advance any claims for the "devitalised vaccine," but the reduction in the number of abortions after the first inoculation, and their complete cessation after the second, is merely in accord with the experience of the past ten years during which this vaccine has been used in dozens of outbreaks with highly satisfactory results. The owner of the herd is so confident that the arrest of the disease was due to the vaccine that he has discarded all other precautions, and is now

RECORD OF AGGLUTINATION TESTS.

Date.	Negative.	Positive.	Abortion.	Total.	Remarks.
16.8.30	1 bull, 31 cows	39 cows	—	71	—
20.8.30	—	—	—	70	One infected cow dead.
26.8.30	—	—	4	—	38 infected cows inoculated with "devitalised vaccine."
27.10.30	1 bull, 33 cows	36 cows	—	70	Two previously infected cows now clean.
29.10.30	—	—	—	—	36 infected cows inoculated.
8. 1.31	1 bull, 36 cows	33 cows	—	70	Three previously infected cows now clean.
19. 2.31	1 bull, 44 cows	25 cows	—	70	Eight previously infected cows now clean.
29. 3.31	1 bull, 47 cows	22 cows *	—	70	Three previously infected cows now clean.

* 13.8.31. Of the 22 positive cows, 5 had healthy calves, 10 were heavy in calf, two were probably in calf, three were empty, 2 had been destroyed.

Sixteen cows previously infected became clean, and were transferred to the clean herd.

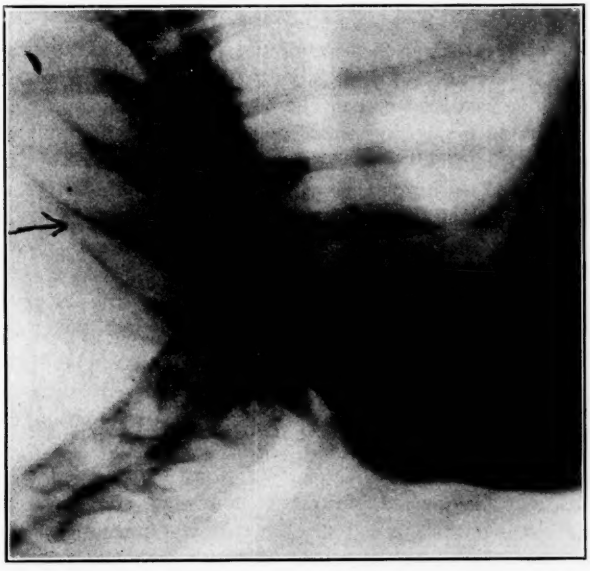
relying entirely on the inoculation of all lean cows and in-coming heifers. A co-operative pasteurising plant has also finally disposed of his scruples as to the use of the milk from reactors.

It is a common experience that infectious abortion "wears itself out," but it seldom does so with such suddenness as in this outbreak, or when half the herd is infected, and the other half is still clean and susceptible. There is reason to believe that in several outbreaks where vaccination has been adopted the passive immunity set up by the vaccine has been rendered active by superimposed natural infection, and that in this way herd immunity has been more rapidly acquired than by the natural process.

We Learn by Our Mistakes.

By J. McCUNN.
Royal Veterinary College.

THE following X-ray print is of interest: as can be easily seen, it is a skiagraph showing a portion of a sheep's vertebra obstructed in the œsophagus of a relatively small dog. The point I wish to stress,



however, is not the obvious one, but the resemblance to a hair-pin exhibited by the spines of the scapulæ. On one occasion some years ago, on the almost sworn testimony of a human radiographer, I searched

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futilely behind the right scapula of a dog for a so-called hair-pin. I was very assiduous in my efforts, for there was a small sinus. I failed to find a hair-pin, and at the owner's request the dog was destroyed. At subsequent *post-mortem* no sign of a foreign body was found. I have since appreciated that the hair-pin was no more than the two normal spines, and I take this opportunity of recording my misfortune in order to protect my colleagues—and, if I may add, the dogs.

A Method for the Amputation of the Scrotum in the Dog.

By J. McCUNN and C. FORMSTON.
Royal Veterinary College.

THERE are many conditions affecting the scrotum which in our opinion are best treated by surgical means, involving complete extirpation: There are two common conditions met with, however, in which our views may meet with some opposition, namely, those met with in old dogs, *i.e.*, the condition which we call varicocele of the scrotal skin; and secondly, the pendulous scrotum due in many cases to debility or loss of elasticity of the scrotal integument. The varicocele condition, with its venous ulceration, rupture and subsequent bleeding, is well known. In the old dog, it is futile to adopt local measures, for no sooner is one spot healed than another area is in impending danger. For a long time it was our opinion that simple castration, followed by the resultant contraction of the scrotal skin, offered the best means of treatment. The slow healing of an already debilitated part resulting in protracted hospital treatment led us to search for other means, and we now claim that by complete excision, not only is a more satisfactory surgical operation performed, but hospital delay and treatment is reduced to a minimum. The stages in the operation which we have attempted to illustrate, are as follows:—

The animal is anæsthetised, and the area shaved and cleaned. The scrotum is then seized, stretched, and grasped at its highest point between the thumb and first finger. A pair of strong forceps is now applied as in Fig. 1. The scrotal skin and fascia is now incised on the distal side of the forceps, down to the spermatic cord and fascia. The severed scrotum is now removed, as in Fig. 2. The forceps is now slackened slightly, and the spermatic ends withdrawn by tension on the testicles. The ends are now ligatured as in Fig. 3, the testicles removed, and the ligatured ends allowed to retract into the wound. Now tighten the clamp. The next stage is to suture the edges of the wound. A continuous suture is used, and the

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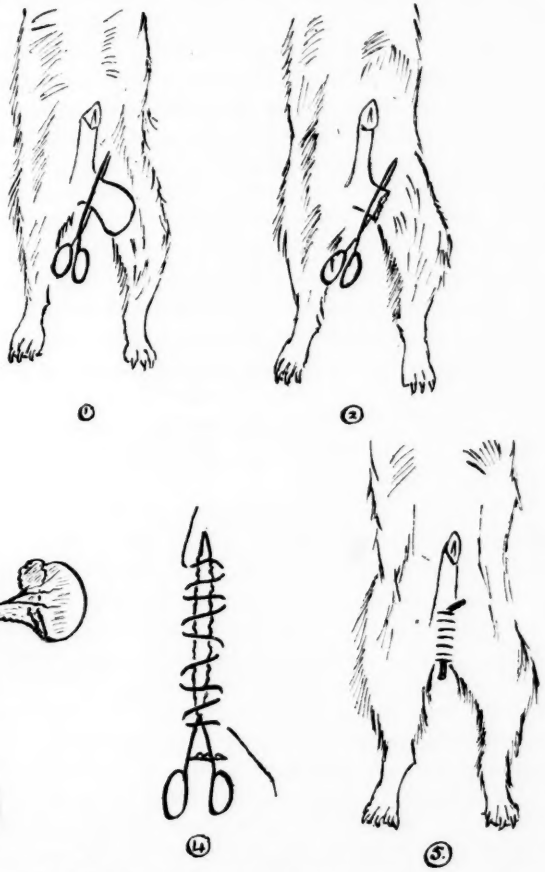
forceps are over-stitched from side to side. Holding the two ends of the suture, slacken, and then withdraw the forceps.

A small piece of drainage tube is now inserted under the suture: one end projects from the anterior end of the incision, and the other from the posterior end. Now tighten the suture and tie its ends. Anchor the drainage tube by a suture passing through skin and tube.



By this method the deeper tissues are never exposed, consequently asepsis is almost certain, and first intention healing assured. The drainage tube provides a ready drainage, and obviates any collection of serum. The tube is removed on the fourth day.

Ten days is generally sufficient to effect complete healing. No bandages or dressings are necessary.

The Result of Anti-Rabic Vaccine Treatment on Three Horses bitten by a Rabid Dog.

By Major G. F. TURNER, M.C.

Officer Commanding the Bodyguard, Trivandrum.

THE horses in question belonged to the Bodyguard of H.H. The Maharaja of Travancore, where they were kept in stables of the regulation pattern. On the morning of February 27th, 1931, a stray dog somehow obtained an entrance to the Bodyguard Lines, and bit three of the horses standing in the stalls. The dog was at once killed by the syces, and the brain was sent to the Government bacteriologist for examination. In the meantime the three horses were medically treated, their wounds being washed with strong carbolic acid solution, and the seat of the bite in each case being cauterised with strong carbolic acid.

Case No. 1 (regimental horse No. 1) was bitten on the muzzle, and received a deep incised wound, and was the first to be bitten.

Case No. 2 (regimental horse No. 27) was also bitten on the muzzle, and received a lacerated wound, and was the second to be bitten.

Case No. 3 (regimental horse No. 46, remount) was bitten above the near fore fetlock, and received only a slight abrasion. This was the last to be bitten.

On February 28th, 1931, it was reported by the Government bacteriologist that the brain of the dog sent to him contained Negri bodies, and on the receipt of this report anti-rabic vaccine treatment was immediately commenced on the three cases. The three animals were isolated, and with effect from March 1st, 1931, one dose of 20 c.c. anti-rabic vaccine was injected subcutaneously every day into each of the three animals for a period of fourteen days. On March 16th, 1931, case No. 1 (regimental horse No. 1) showed the following symptoms: suspicious appearance, normal temperature, refusal of food, grinding of the teeth, smacking of the lips, extreme thirst, but inability to swallow; slight excitement, and partial paralysis of the hind legs and throat. On March 17th, 1931, the symptoms of case No. 1 were a little more aggravated, temperature 102.8, slight dribbling from the mouth, complete loss of appetite, and paralysis of the limbs and throat still more pronounced, with great depression. It was evident from the symptoms that it was a clear case of rabies, and the animal was immediately shot, and the carcase duly disinfected and buried.

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Cases 2 and 3 were kept under observation for a period of six months after the injections, and they have not so far shown any abnormal symptoms. They are carrying out their usual work, and appear to be thoroughly fit and well.

An Interesting Parturition Case in a Cat.

By TREVOR SPENCER, M.R.C.V.S.

Kettering.

A SMOKE-GREY cat, age four and a-half years, recently had kittens under very unusual circumstances. The cat, after having influenza in September, had three dead kittens, prematurely born, on September 21st. She appeared to get quite well, and went her full period of gestation, and then had one live kitten on October 20th. This kitten was taken away from her and drowned, as she could not suckle it, and it was obvious she was still pregnant.

As she could not give birth to the remaining kitten, pituitrin was injected on October 21st (noon and evening). As she was still in difficulties, further doses of pituitrin were injected on October 22nd (morning and noon), and she gave birth to a dead and putrid kitten on the 23rd. After further injections of pituitrin on 23rd and 24th, she made satisfactory progress, and has since progressed satisfactorily. From October 20th, she ate nothing, and mainly sustained herself on water for four days.

This is not the only occasion this patient has had an abnormal parturition. Three years ago three dead kittens were born seven days prior to two live ones, which she successfully reared.

Abstracts of Current Literature

Veterinary Physiological Abstracts.—By W. P. BLOUNT, F.R.C.V.S.

Bile.—Substances which will cause an increase in the flow of bile are admittedly few, but Czarnecki finds that an intravenous injection of methylene blue in the dog is successful. Measuring the quantities passed out *via* a fistula of the bile duct, he obtained a 200 per cent. increase. Jaundice is never a satisfactory disease to tackle, so that the above method should be worthy of a trial, provided the cause of the excess bile in the blood stream is not due to an obstruction of main duct.

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Nitescu produced marked cholagogue effects by the use of insulin after the ingestion of milk. If this is effective for any of the domestic animals, a milk diet combined with subcutaneous injections of insulin in small doses may provide a new treatment in icterus.

Calcium.—Minot, using dogs as his experimental animals, found that large doses of carbon tetrachloride produced little change in the liver (as evidenced by the presence of bilirubin in the serum) provided the diet was well balanced. If, however, the calcium content was low, the same doses caused tetanic convulsions, coma and death. He was able to prevent the latter by intravenous injections of calcium or ammonium chloride. Carbon tetrachloride, as is well known, is now favoured as an anthelmintic in certain parasitic diseases, and although toxic effects are uncommon, there is a strong possibility that some mountain sheep affected with liver-fluke infestation are on a diet low in calcium. Appropriate treatment may precipitate these cases, but in calcium we have a suitable antidote.

It is not difficult to conceive cases of coal-gas poisoning occurring in the dog. The delayed effects of this can be successfully treated by the intravenous injection of sodium thiosulphate combined with calcium salts subcutaneously (Ziegler).

Diuresis and Pituitrin.—Hoff and Wermer obtained increased amounts of pituitrin (found by the examination of the cerebro-spinal fluid per cysterna magna) after causing diuresis in dogs with urea. This result may be of value in parturition cases, in that bitches should be encouraged to drink large quantities of fluid once normal labour pains are commencing ; or, in cases where pituitrin would normally be administered, but is inaccessible, urea diureses may be tried.

Pharmacology.—The toxicity of strychnine may be greatly increased by the addition of sodium carbonate, the alkali releasing the alkaloid base more rapidly than normal. Similarly, the anæsthetic effect of cocaine may be increased sevenfold if the pH of the vehicle be raised from between 3 and 7 to pH 8.4 (Jarisch). This may seem to some to be a new application for alkaline therapy.

Insulin is believed to be ineffective owing to gastric destruction when given by mouth, but Lasch and Brugel have shown that it can be just as effective by this method of administration in rabbits, dogs, and man when combined with $\frac{1}{2}$ gm. of saponin, as when given subcutis. Saponin has the power to decrease surface tension, and although used commonly in physiological laboratories for experimental purposes, it is not seen in many veterinary pharmacies. It is known to increase glucose absorption from the intestines in the dog, it itself having no effect on the blood sugar. Although this specific instance of its value

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in assisting alimentary absorption is perhaps not apparently useful, the principle of its action is established, and can be tried with other drugs. Berger, for instance, found that 1/5 gm. of saponin added to the diet raised the blood calcium from 7 to 40 per cent.

Caffeine stimulates the dog's heart, whereas similar doses depress it in the cat and rabbit. Smaller doses, however, in the cat do stimulate cardiac activity (Salant and Nadler).

Quinine, when administered before an operation, has been found to allow dogs to tolerate more chloroform, and protect them against ventricular fibrillation (syncope) if adrenalin be given during the anæsthesia (Bardier and Silemunkes).

Ammonium chloride is known to have marked effects in cases of tetany, but this is probably due to a lowering of the pH rather than to direct action on the serum calcium (Wenner).

Magnesium chloride produces a more marked alkalinity of the urine (Mioumi).

Fat.—A diet rich in fat is seen to retard the onset of the flow of free HCl, and to delay the rise in acidity (Steinitz and Sternfield); in 50 per cent. of the cases it caused a lasting decrease in the free acid. The same is true of the total acidity and chloride content, although gastric motility was unimpaired. Whether this could be applied to animals with hyperacidity or gastric ulceration associated with high gastric acid content has yet to be determined.

Fleisch found that 0.1 to 1 mg. of *adrenalin* given intravenously decreased the blood fat 17–30 per cent. in twenty-four hours. Three to six mg. subcutis reduced the blood fat 200 to 400 per cent. in one to two days.

Heart.—The heart minute-volume of the male dog was found to be constant (10 per cent.) over a period of years, but in the bitch it varied during œstrus. Although the heart-beats per minute vary from 60–110 there is no change in the cardiac output, and therefore the output per beat varies inversely as the pulse rate (Marshall). Normally the heart is inadequately filled. In the pregnant bitch the pulse-rate increases, and there is a proportionate increase in the minute-volume. Clinically canine practitioners meet cases of diminution in the rhythm of the cardiac impulse associated with a shortening of the auriculo-ventricular interval; experimentally this is seen to be associated with removal of the Keith-Flack node in dogs, cats and rabbits (Rylant).

(*To be continued.*)

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Corrigendum.

Page 542.—For "Veterinary Adrenal Cortex and its Functions," read "Veterinary Physiological Abstracts," with sub-heading "Adrenal Cortex and its Functions."

Reviews

Diseases of the Small Domestic Animals. By O. V. BRUMLEY. 2nd ed. Pp. 611. London: Baillière, Tindall & Cox. 25*s*.

THE book, a revised first edition, consists of 582 pages of subject matter which deals chiefly with diseases of the dog and cat; although some of the commoner diseases of the rabbit are discussed. The first 541 pages treats systematically the diseases of the various organs, whilst the remainder are devoted to the discussion of contagious diseases. Symptomatology is in excellent detail, but the dice is loaded in favour of the medicinal rather than the surgical aspect. Whilst the author discusses rabies at great length, a subject of importance to American and Continental veterinarians, tuberculosis (of which one would like to hear more) is only cursorily dealt with. The inclusion of illustrations and plates would be a distinct advantage, although the interesting way in which problems are elucidated somewhat fills the breach. It is undoubtedly an ideal book for the student and the busy practitioner whose daily work includes a large small-animal *clientèle*.

C. F.

Grundlagen Einer Klinischen Hæmatologie der Haustiere.—By DR. D. WIRTH, Professor of Internal Medicine at the Veterinary School in Vienna. Berlin and Vienna: Urban and Scharzenburg, Berlin, N.24, Friedrichstr., 105B. First edition. 1931. Pp. 306, with 51 figures in the text, and 8 coloured plates. Price M. 25; bound, M. 27.40.

THIS is an excellent book dealing with the groundwork of clinical hæmatology in the domestic animals. It breaks new ground, as hitherto no collective work on the study of the blood of animals has yet appeared in veterinary literature. The appearance of normal blood is described, and contrast may be made between it and the various changes that occur in its corpuscular elements as a result of disease. It is full of interest not only to the research worker, but also to the general practitioner. It is divided into three main sections: (I) A general portion; (II) normal blood appearance of domestic animals, and a few other animals (amphibia and reptiles, frogs, fish, bees); (III) a special pathological hæmatology. In Section I there is an interesting reference to the physiological fluctuations in the composition of the blood. The author shows how this may vary as a result of sex, bodily condition, parturition and pregnancy, lactation, feeding, digestion, work, castration, residence above sea level, light, and length of life. There is much that is worthy of note on the technique of blood examination as given in the first section (pp. 7 to 65). As regards Section III, it is a veritable mine of information for the pathologist. Here one may learn all about anæmia and leukæmia, and the

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pages on infectious leukæmia of the fowl put before the reader the various views of research workers on this widespread disease. Diseases of the blood due to bacterial and virus infections are comprehensively dealt with, as are also those due to parasites and diseases of special organs. The book concludes with a description of the effects on the blood of Röntgen rays and ultra-viclet light, and of examinations of the blood in animal breeding, and of the results of the transfusion of blood between different races of animals. The eight coloured plates are beautifully reproduced, and twenty-four pages of bibliography are a tribute to the author's acumen and industry. The book is well printed and eminently worthy of a large circulation among all those who are ever seeking to increase their knowledge and advance in their profession.

MONSOL VETERINARY PREPARATIONS.

FOR some years Monsol preparations have found their place as antiseptics of great value both for internal and external use in the treatment of the diseases of animals equally with the treatment of diseases of human beings ; and Monsol Veterinary Fluid combines the advantage of germicidal potency, unaffected by the presence of organic matter, with safety in use. Properly diluted according to directions, it will be found especially useful in the treatment of septic wounds, streptococcal infections, and parasitic skin complaints in both horses and dogs. As a douche for cattle patients after cases of dystortion, and in cases of metritis, its use is especially valuable. Laboratory observations have set the average useful and effective percentage at about 1 in 200, whilst for ordinary wounds and sores 1 in 100 is sufficient.

The proprietors (The Mond Staffordshire Refining Co., Abbey House, Westminster) have numerous serviceable preparations made up in convenient form for veterinary use, including an ointment which contains 5 per cent. of the active principle of Monsol ; vaginal pessaries of all sizes, and keratin-coated capsules for small animals containing from 5 to 15 minims, made specially for combating the diarrhœic affections which have their origin in the contents of the lower bowel. The sole distributors in the United Kingdom are Messrs. Leonard Smith & Co., Causeway Mills, Blackheath, Birmingham.

News

THE OLYMPIA CIRCUS.

WHEN the twelfth Christmas season of Bertram Mills' International Circus and Fun Fair opens at Olympia in the Grand Hall on December 22nd, the greatest aggregation of famous artistes that has ever been assembled on one programme will be presented. Each season Capt Mills has managed to improve on the preceding one, although the task has been naturally one of difficulty. Amongst the artistes, a girl of nineteen who has attained fame throughout the Continent, will show the complete

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mastery that can be obtained over magnificent horses by kindness and understanding. There will be a splendid wild animal act in which one of the most famous trainers in the world will make his great charges do almost unbelievable tricks; and the two baby lion cubs, Juba and Joker, which were presented to Miss Peggy Salaman in Central Africa during her record-breaking flight to the Cape, will be shown for London Hospital charities. For those who love animals, Olympia will be the rendezvous of all during the Christmas season.

Obituary

ALFRED JOSEPH SEWELL, M.R.C.V.S.

THE death of Mr. Alfred J. Sewell has severed a link between the older veterinary surgeons and those of the modern school, which has existed for more than fifty years. Graduating at the Royal Veterinary College in 1877, Mr. Sewell commenced practice in the West End of London in partnership with his brother, but finding that his opportunity lay in the canine branch of the profession, he decided to specialise in this side alone, and the partnership was dissolved. As a canine surgeon only Mr. Sewell speedily made a very large *clientèle*, and his appointment to the Kennel Club as the official veterinary adviser gave him an entré into the show world which brought him many influential friends.

The crowning point of his career was attained when he received the Royal Warrant as canine surgeon to the late King Edward VII and Queen Alexandra. This appointment was carried on by the present King and Queen; and Mr. Sewell had also the appointment of canine surgeon to H.R.H. the Prince of Wales. During the past five or six years Mr. Sewell's health had suffered a great deal; and the death of his son, Capt. Louis Sewell (who had joined the firm after the Great War) was a severe blow from which he never properly recovered.

He spent his later years at his country residence at Chertsey, where he made a hobby of gardening, his collection of rock garden plants being considered one of the largest and most famous in Great Britain.

As an author, he had written several books of popular interest; and he was known as a specialist in canine diseases, not only all over Great Britain, but amongst the dog owners of almost every part of Europe.

Publishers' Notices

All communications should be addressed to 7 & 8, Henrietta Street, Covent Garden, London, W.C. 2. Telephone: Temple Bar 4646. Telegrams: "Baillière Phone, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Copy of advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 25th of the month, or if proof is required, not later than the 23rd.

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